REMARKS

This amendment is responsive to the non-final Office Action of January 13, 2010. Reconsideration and allowance of claims 1-4 and 8-14 are requested.

The Office Action

Claims 1-4 and 8-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Wu in view of Holten-Lund et al. (VRML Visualization in a Surgery Planning and Diagnosis Application, in Proc. VRML, 2000).

Claims 1, 8-10, and 12 stand objected to 37 CFR 1.75(a).

Claim 13 stand rejected under 35 U.S.C. § 112, first paragraph.

The Present Application

The present application is directed to determining geometrical properties of an anatomical object. An deformable surface model is used to generate an adapted deformable surface model from which geometrical properties are extracted. An extended deformable surface model is generated by integrated the extracted geometrical properties into the adapted deformable surface model.

The References of Record

Wu discloses a method for describing 3D objects by fitting parametric geons to parts of the 3D object and optimizing the fit by minimizing a fitting residual.

Holten-Lund et al. discloses a method for fitting an iso-surface to an anatomical feature. Primitives are approximated based on the fitted iso-surface and then quantified to measure the topology of the anatomical feature.

Request for Finality of the Outstanding Office Action be Withdrawn

In the previous Office Action dated July 7, 2009, claims 1-4 and 8-9 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Wu in view of Holten-Lund et al. (VRML Visualization in a Surgery Planning and Diagnosis

Application, in Proc. VRML, 2000). In a Response thereto filed on October 7, 2009, Applicants traversed the rejection via argument.

However, the outstanding Office Action again rejected claims 1-4 and 8-9 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Wu in view of Holten-Lund et al. (VRML Visualization in a Surgery Planning and Diagnosis Application, in Proc. VRML, 2000) without responding to the clear traversal presented in Applicants' previous Response filed October 7, 2009. This failure to answer the substance of Applicants' arguments renders the Office Action incomplete as to all matters, as is required by 37 C.F.R. § 1.104(b). Further, MPEP § 707.07(f) states that "[i]n order to provide a complete application file history and to enhance the clarity of the prosecution history record, an examiner must provide clear explanations of all actions taken by the examiner during prosecution of an application". "Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it" (Id.). "The examiner must address all arguments which have not already been responded to in the statement of the rejection" (MPEP § 707.07(f), Examiner Note 1).

In the present case, the outstanding Office Action essentially repeats the rejections presented in the previous Office Action and fails to address Applicant's clear traversals. In fact, none of Applicant's arguments are specifically addressed in the outstanding Office Action. Further, failure to specifically respond to Applicant's arguments renders the Office Action arbitrary and capricious, and therefore invalid under the Administrative Procedure Act (5 U.S.C. § 706), a standard to which all Actions by the USPTO must adhere (see Dickenson v. Zurko, 527 U.S. 150 (1999)).

Applicants respectfully request that the Examiner address the substance of Applicants' arguments in the next Office Action. Further, Applicants respectfully note that at least because the outstanding Office Action is incomplete under 37 C.F.R. § 1.104(b) and does not meet the requirements of MPEP § 707.07(f), a next Action in this case cannot properly be made final. Applicants respectfully request that the finality of the outstanding Office Action be withdrawn because the arguments filed October 7, 2009 have not been fully considered.

The Present Amendment

The present amendment should be entered as reducing the issues on appeal. Specifically, the presented amendment resolves the 35 U.S.C. § 112 issue without requiring further search or consideration.

Regarding the 35 U.S.C. § 112, first paragraph rejection, the Examiner asserted that application does not disclose two spheres and referred the applicant to page 10, lines 17-27. Because page 10, lines 17-27 does not discuss spheres, it is believed that the Examiner should have referenced pg 7, lines 17-27 which addresses a femur head and shaft and their associated primitives a sphere and line respectively. Claim 13 has been revised to conform to the paragraph referenced by the Examiner. Because Claim 13 has been amended to conform to the Examiner's referenced section, it is submitted that the Examiner has considered the subject matter of Claim 13 and that no further search or consideration would be required.

The Claims Distinguish Patentably Over the References of Record

Claims 1-4 and 8-14 Are Not Obvious Over Wu In View Of Holten Lund et al.

Claim 1 calls for a method for determining geometrical properties of a structure of an object display in an image, the method includes adapting a deformable surface model to the object. Additional information is applied to the adapted deformable model and geometrical properties of the structure of the object from the adapted deformable surface model to which the additional geometrical information has been applied.

The Examiner applies Wu in combination with Holten-Lund to remedy that "Wu does not disclose extracting the geometric properties of the structure of the object from the adapted deformable surface model to which additional geometric information has been applied".

The Examiner contends that the iso-surface is an adapted deformable surface model to which the Applicants respectfully disagree. The Holten-Lund discloses that "[t]he iso-surface models were created in advance using an in-house developed application which generates VRML models directly using the marching

cubes algorithm" (pg. 112, § 2, ¶ 1-2). A marching cube algorithm, to a person having ordinary skill in the art, is an algorithm for rendering and iso-surfaces from volumetric image data. A voxel or cube is defined by pixels values at the eight corners of the cube. If one or more pixels of a cube have a value less than a user-specified iso-value and one or more pixels of the same cube have a value greater than the iso-value, the voxel contributes some component to the iso-surface. Polygon patches, typically triangles, are created by determining which edges of the cube are intersected by the iso-surface. The polygon patches from all of the cubes are fused together to form an iso-surface. Therefore, Holten-Lund teaches away from adapting a deformable surface model because the marching cube algorithm does not adapt a deformable surface model because there is no surface model available to the marching cube algorithm prior to the iso-surface model for adaptation, only volumetric image data is available.

The Examiner asserts that this iso-surface model is an adapted deformable surface model because "specifications of the model parameter, i.e. vertices, edges, texture, etc.," can be changed. The Applicants respectfully disagree. The topology, stored in the coordIndex (coordinates and coordinate indexes) of the iso-surface would have to be changed. This would require a JSAI scripting node to pass VRML events between to the JAVA environment requesting a coordinate or coordinate index be changed.

Hypothetically, if the iso-surface were deformable, there is no advantage of deforming the marching cube iso-surface back to the surface from which it was created. The initial iso-surface and the deformed iso-surface would be identical.

The Holten-Lund does not provide an enabling disclosure. On page 115, § 2.3, ¶ 1 and 2, Holten-Lund states that the described process could not be performed with available browsers. The authors resorted to undisclosed workarounds. Due to these shortcomings, the authors are looking to invent a VRML browser based implementation but have not yet done so (pg. 116, § 3, ¶ 1).

For the reasons set forth above, it is submitted that Wu in view of Holten-Lund fails to teach all of the features of the Applicants' invention; therefore, does not anticipate **claim 1**. Applicants submit that the subject application is patently distinguished from the cited prior art and respectfully request the rejection of claim 1

be withdrawn. Accordingly, it is submitted that **claims 2-4 dependent therefrom** distinguish patentably and over the references of record.

Claim 8 calls for an image processing device comprising an image processor for determining geometrical properties of an object. The processor is programmed to adapt a deformable surface model to the object. Additional information is applied to the adapted deformable model and geometrical properties of a structure of the object are extracted from the adapted deformable surface model.

The Examiner applies Wu in combination with Holten-Lund to remedy that "Wu does not disclose extracting the geometric properties of the structure of the object from the adapted deformable surface model to which additional geometric information has been applied".

The Examiner contends that the iso-surface is an adapted deformable surface model to which the Applicants respectfully disagree. The Holten-Lund discloses that "[t]he iso-surface models were created in advance using an in-house developed application which generates VRML models directly using the marching cubes algorithm" (pg. 112, § 2, ¶ 1-2). First, the iso-surface model is not generated from VMRL, as stated by the Examiner, and thus it cannot be implied that the iso-surface is deformable by changing the specifications of the model as contended by the Examiner.

Second, a marching cube algorithm, to a person having ordinary skill in the art, proceeds through a scalar field (i.e. voxels), taking eight neighbor locations at a time (thus forming an imaginary cube), then determines polygon(s) needed to represent the part of the polygonal mesh of an iso-surface that passes through this cube. The individual polygons are then fused into the desired surface. Therefore, to generate the iso-surface there is no adaptation of a deformable surface model because there is no model present prior to the iso-surface model to adapt.

Furthermore, Holten-Lund discloses having an iso-surface and not a deformable model stored in memory (pg. 112, § 2.1.1, ¶ 1). The IndexedFaceSet, which defines the surface of the iso-surface (pg. 112, § 2.1, ¶ 2), is read, stored, and transformed. To perform these operations, the IndexedFaceSet must be stored on a memory for computer processor access.

Accordingly, it is submitted that **claim 8** distinguish patentably and over the references of record.

Claim 9 calls for a computer-readable medium having processor instructions for controlling a processor to perform the steps of determining geometrical properties of an object. The steps performed include adapting a deformable surface model to the object. Additional information is applied to the adapted deformable model and geometrical properties of a structure of the object are extracted from the adapted deformable surface model.

The Examiner applies Wu in combination with Holten-Lund to remedy that "Wu does not disclose extracting the geometric properties of the structure of the object from the adapted deformable surface model to which additional geometric information has been applied".

The Examiner contends that the iso-surface is an adapted deformable surface model to which the Applicants respectfully disagree. The Holten-Lund discloses that "[t]he iso-surface models were created in advance using an in-house developed application which generates VRML models directly using the marching cubes algorithm" (pg. 112, § 2, ¶ 1-2). First, the iso-surface model is not generated from VMRL, as stated by the Examiner, and thus it cannot be implied that the iso-surface is deformable by changing the specifications of the model as contended by the Examiner.

Second, a marching cube algorithm, to a person having ordinary skill in the art, proceeds through a scalar field (i.e. voxels), taking eight neighbor locations at a time (thus forming an imaginary cube), then determines polygon(s) needed to represent the part of the polygonal mesh of an iso-surface that passes through this cube. The individual polygons are then fused into the desired surface. Therefore, to generate the iso-surface there is no adaptation of a deformable surface model because there is no model present prior to the iso-surface model to adapt.

Accordingly, it is submitted that **claim 9** distinguish patentably and over the references of record.

Claim 10 calls for a method for determining geometric properties of a subpart of an object. The method includes, with a processor, applying a deformable model represented by a polygon mesh to a surface of an object of interest from an image. With a processor, the deformable model is optimally deformed to a surface of the at-least on subpart of the surface of the object of interest. With the processor, geometrical properties of the object of interest are determined based on the deformable model fit to the sub-part.

The Examiner applies Wu in combination with Holten-Lund to remedy the shortcoming Wu which "does not disclose determining geometrical properties of the object of interest based on the deformable model fit to the sub-part" according to the Examiner.

The Examiner contends that the iso-surface is a deformable model fit to the sub-part to which the Applicants respectfully disagree. The Holten-Lund discloses that "[t]he iso-surface models were created in advance using an in-house developed application which generates VRML models directly using the marching cubes algorithm" (pg. 112, § 2, ¶ 1-2). First, the iso-surface model is not generated from VMRL, as stated by the Examiner, and thus it cannot be implied that the iso-surface is deformable by changing the specifications of the model as contended by the Examiner.

Second, a marching cube algorithm, to a person having ordinary skill in the art, proceeds through a scalar field (i.e. voxels), taking eight neighbor locations at a time (thus forming an imaginary cube), then determines polygon(s) needed to represent the part of the polygonal mesh of an iso-surface that passes through this cube. The individual polygons are then fused into the desired surface. Therefore, to generate the iso-surface there is no adaptation of a deformable surface model because there is no model present prior to the iso-surface model to deform.

For the reasons set forth above, it is submitted that Wu in view of Holten-Lund fails to teach all of the features of the Applicants' invention; therefore, does not anticipate **claim 10**. Applicants submit that the subject application is patently distinguished from the cited prior art and respectfully request the rejection of claim 10 be withdrawn. Accordingly, it is submitted that **claims 11-14 dependent therefrom** distinguish patentably and over the references of record.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-14 distinguish patentably over the references of record and meet all statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, the Examiner is requested to telephone Thomas E. Kocovsky at 216.363.9000.

Respectfully submitted,

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